

CLAIMS

1. A method of running a bore-lining tubing string into a bore, the method comprising running a tubing string into a bore while agitating the string to reduce the friction between the string and the bore wall and facilitate the translation of the string into the bore.

2. The method of claim 1, wherein the tubing string is the last string of bore-lining tubing to be run into the bore.

3. The method of claim 1 or 2, wherein the agitation of the string at least reduces static friction between the string and the bore wall.

4. The method of claim 1, 2 or 3, wherein the agitation of the string serves to at least reduce gellation of fluid in the bore.

5. The method of claim 1, 2, 3 or 4, wherein the agitation of the string serves to fluidise sediments lying on the low side of a deviated bore.

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6. The method of any of the preceding claims, wherein the tubing string is translated axially.

7. The method of any of the preceding claims, wherein the tubing string is rotated as it is advanced into the bore.

8. The method of any of the preceding claims, wherein a cutting structure is provided at a leading end of the string.

9. The method of any of the preceding claims, wherein at least a leading end of the string is rotated by a downhole motor.

10. The method of any of the preceding claims, wherein the string is rotated from surface.

11. The method of any of the preceding claims, wherein in excess of 50% of the weight applied to the string is transferred to the leading end of the string.

12. The method of any of the preceding claims, wherein in excess of 70% of the weight applied to the string is transferred to the leading end of the string.

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13. The method of any of the preceding claims, wherein in excess of 85% of the weight applied to the string is transferred to the leading end of the string.

5 14. The method of any of the preceding claims, wherein the string is agitated by operation of an agitator in the string.

10 15. The method of any of the preceding claims, wherein the string is agitated by operation of an agitator towards a leading end of the string.

15 16. The method of any of the preceding claims, wherein the string is agitated by operation of a plurality of agitators in the string.

17. The method of any of claims 14 to 16, wherein the agitator is actuated by fluid.

20 18. The method of claim 17, wherein the agitator is actuated by fluid pumped through the tubing string.

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19. The method of claim 17 or 18, wherein the agitator is actuated by at least one of drilling fluid, cement slurry and treating fluid.

5 20. The method of claim 19, wherein the agitator is actuated by both drilling fluid and cement slurry.

21. The method of any of claims 17 to 20, wherein the fluid actuates a downhole motor.

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22. The method of any of claims 17 to 21, wherein the fluid actuates a downhole positive displacement motor, whereby the speed of the motor, and thus the rate of agitation, is controlled by varying the fluid flow rate.

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23. The method of any of claims 14 to 22, wherein the agitator includes a valve having an element that is moved to vary the dimension of a fluid passage.

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24. The method of claim 23, wherein the fluid passage dimension controls flow of fluid through at least a portion of the string.

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25. The method of claim 23 or 24, in which the fluid passage dimension is varied between a larger open area and a smaller open area.

5 26. The method of claim 25, wherein the fluid passage includes a flow passage portion that remains open.

10 27. The method of any of claims 23 to 26, wherein the agitator provides positive pressure pulses in the fluid above the valve and negative pressure pulses in the fluid below the valve.

15 28. The method of any of claims 23 to 27, wherein the agitator provides pressure pulses which act on a shock tool in the string to axially extend and contract the tool in response to the pressure pulses.

29. The method of claim 28, wherein positive pressure pulses are applied to the shock tool.

20 30. The method of claim 28 or 29, wherein the shock tool is provided above the agitator.

31. The method of claim 28 or ²² 29, wherein the shock tool is provided below the agitator.

32. The method of any of claims 23 to 31, wherein the agitator comprises a driven valve element which is moved positively to vary the flow passage area.

33. The method of claim 32, wherein the valve element is driven by the rotor of a fluid driven motor.

34. The method of claim 33, wherein the valve element is driven by the rotor of a positive displacement motor.

35. The method of claim 34, wherein the rotor provides at least one of rotational, transverse and axial movement of the element.

36. The method of claim 35, wherein the rotor is of a Moineau principle motor and is directly coupled to the valve member and provides both rotational and transverse movement to the valve member.

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37. The method of any of the preceding claims, further comprising cementing the tubing string in the bore while agitating the string.

5 38. The method of any of the preceding claims, further comprising cementing the tubing string in the bore while applying pressure pulses to the cement as it flows into and through the annulus.

10 39. The method of claim 38, further comprising applying negative pressure pulses to the cement.

15 40. The method of any of claims 37 to 39, further comprising agitating the string after the annulus has been filled with cement.

20 41. The method of any of the preceding claims, further comprising varying the agitation frequency of the string between at least two predetermined agitation frequencies.

42. The method of any of the preceding claims, further comprising producing pressure pulses in the string.

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43. The method of claim 42, further comprising varying the amplitude of the pressure pulses between at least two predetermined amplitudes.

5 44. The method of any of the preceding claims, wherein the means utilised to agitate the string is left in the bore following cementation of the string in the bore.

10 45. The method of claim 44, further comprising drilling through said means and drilling the bore beyond the end of the tubing string.

15 46. The method of claim 44, wherein said means is at least part soluble and the method further comprises passing an appropriate material into the bore to at least weaken the means and then removing the means from the bore.

47. The method of any of claims 1 to 43, wherein the means utilised to agitate the string is retrieved from the bore.

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48. A method of cementing a bore-lining tubing string in a bore, the method comprising pumping cement into an annulus surrounding the string while agitating the string.

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49. A method of cementing a bore-lining tubing string in a bore, the method comprising pumping cement into an annulus surrounding the string while applying pressure pulses to the cement.

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50. Apparatus for use in agitating a bore-lining tubing string in a bore comprising an agitator adapted to be mounted in a bore-lining tubing string for agitating the string in a bore to reduce the friction between the string and the bore wall as the string is moved in the bore.

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51. The apparatus of claim 50, in combination with a cutting structure for location at a leading end of the string.

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52. The apparatus of claim 51, wherein the cutting structure is a drill bit.

53. The apparatus of any of claims 50 to 52, in combination with a downhole motor.

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54. The apparatus of any of claims 50 to 53 wherein the agitator is adapted for location towards a leading end of the string.

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55. The apparatus of any of claims 50 to 54, wherein the agitator is fluid actuated.

5 56. The apparatus of claim 55, wherein the agitator is adapted to be actuated by fluid which is pumped through the tubing string.

10 57. The apparatus of claim 56, wherein the agitator is adapted to be actuated by at least one of drilling fluid, cement slurry and treating fluid.

58. The apparatus of claim 57, wherein the agitator is adapted to be actuated by both drilling fluid and cement slurry.

15 59. The apparatus of any of claims 50 to 58, further comprising a downhole motor.

60. The apparatus of claim 59, wherein the motor is a positive displacement motor.

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61. The apparatus of any of claims 50 to 60, wherein the agitator includes a valve having valve element that is movable to vary the dimension of a fluid passage.

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62. The apparatus of claim 61, wherein the fluid passage dimension controls flow of fluid through at least a portion of the string.

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63. The apparatus of claim 61 or 62, wherein the fluid passage dimension is adapted to be varied between a larger open area and a smaller open area.

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64. The apparatus of claim 63, wherein the flow passage includes a flow passage portion that remains open.

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65. The apparatus of any of claims 61 to 64, wherein the agitator is adapted to provide positive pressure pulses in the fluid above the valve and negative pressure pulses in the fluid below the valve.

66. The apparatus of any of claims 50 to 65, further comprising a shock tool.

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67. The apparatus of claim 66, wherein the shock tool is arranged to axially extend and contract in response to pressure pulses.

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68. The apparatus of claim 66 or 67, wherein the shock tool is adapted for location above the agitator.

5 69. The apparatus of claim 66 or 67, wherein the shock tool is adapted for location below the agitator.

70. The apparatus of any of claims 50 to 69, wherein the agitator comprises a driven valve element.

10 71. The apparatus of claim 70, wherein the valve element is coupled to the rotor of a fluid driven motor.

72. The apparatus of claim 71, wherein the valve element is coupled to the rotor of a positive displacement motor.

15 73. The apparatus of claim 72, wherein the rotor is adapted to provide at least one of rotational, transverse and axial movement.

20 74. The apparatus of claim 73, wherein the rotor is of a Moineau principle motor and is directly coupled to the valve member and provides both rotational and transverse movement to the valve member.

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75. The apparatus of any of claims 50 to 74, wherein the apparatus is adapted to be drillable.

5 76. The apparatus of any of claims 50 to 74, wherein the apparatus is at least part soluble.

77. The apparatus of any of claims 50 to 74, wherein the apparatus is adapted to be retrievable.

10 78. The apparatus of claim 77, wherein the apparatus is adapted to be run on a separate string.

79. The apparatus of claim 77, wherein the apparatus is adapted to be releasably mounted in the tubing string.

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